AD-A195 269 INSTALLATION RESTORATION PROGRAM PRELIMINARY ASSESSMENT FOR THE 162ND TAC..(U) HAZARDOUS MATERIALS TECHNICAL CENTER ROCKVILLE MD OCT 87 DLA900-82-C-4426 1/1

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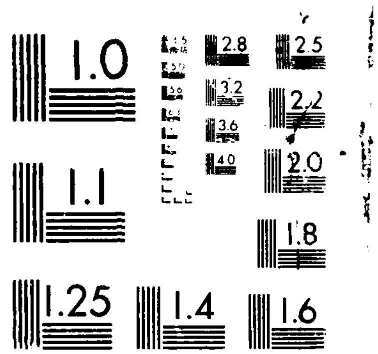


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963

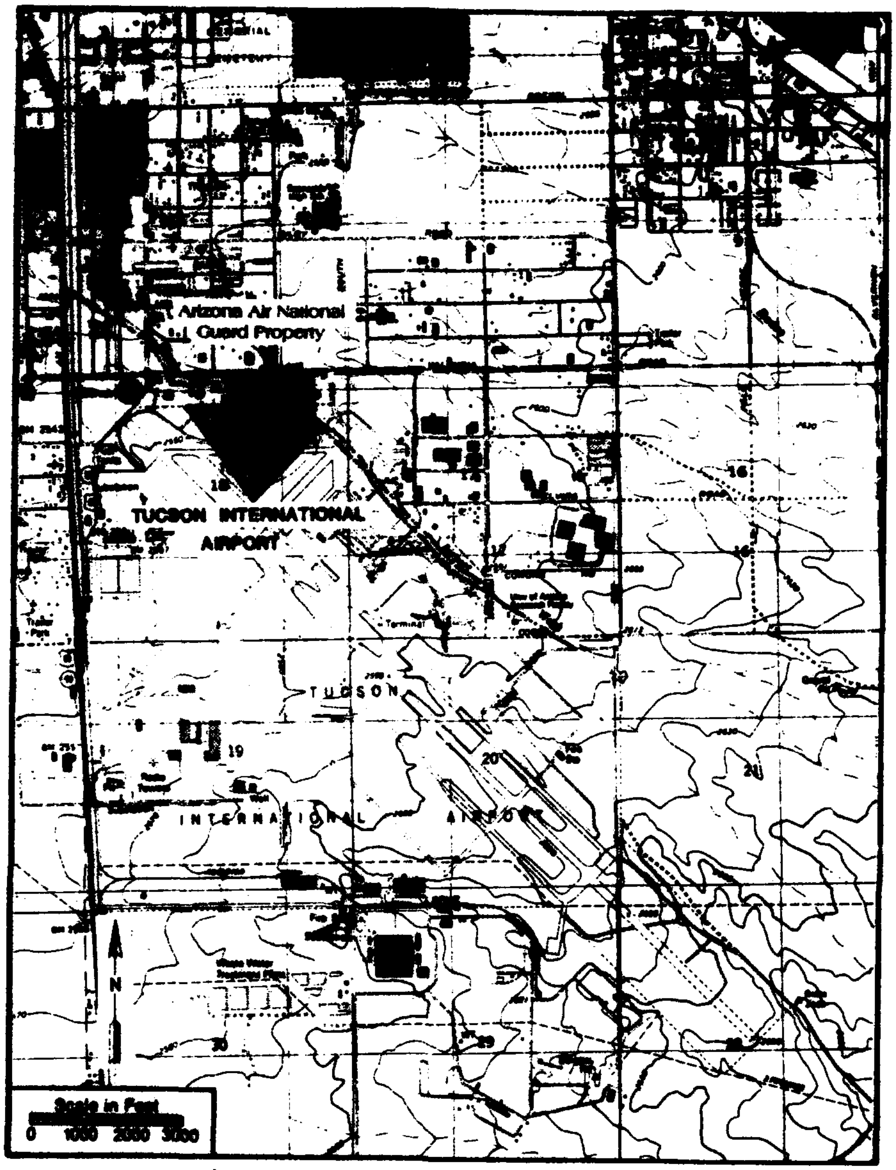
INSTALLATION RESTORATION PROGRAM

Preliminary Assessment
Records Search

162nd Tactical Fighter Group
Arizona Air National Guard
Tucson International Airport
Tucson, Arizona

Hazardous Materials Technical Center

October 1987



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INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT - RECORDS SEARCH

FOR

162nd TACTICAL FIGHTER GROUP
ARIZONA AIR NATIONAL GUARD
TUCSON INTERNATIONAL AIRPORT
TUCSON, ARIZONA

October 1987

Prepared for

National Guard Bureau
Andrews Air Force Base, Maryland

Prepared by

Hazardous Materials Technical Center
The Dynamac Building
11140 Rockville Pike
Rockville, MD 20852

Contract No. DLA 900-82-C-4426

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EXECUTIVE SUMMARY

A. INTRODUCTION

The Hazardous Materials Technical Center (HMTC) was retained in April 1986 to conduct the Installation Restoration Program (IRP) Preliminary Assessment - Records Search of the 162nd Tactical Fighter Group (TFG), Arizona Air National Guard, Tucson International Airport, Tucson, Arizona (hereinafter referred to as the Base), under Contract No. DLA 900-82-C-4426 (Records Search). The Records Search included:

- o an onsite visit, including interviews with 28 Base personnel conducted by HMTC personnel during 13-17 April 1987;
- o the acquisition and analysis of pertinent information and records on hazardous materials use, and hazardous waste generation and disposal at the Base;
- o the acquisition and analysis of available geologic, hydrologic, meteorologic, and environmental data from pertinent Federal, State, and local agencies; and
- o the identification of sites on the Base which may be potentially contaminated with hazardous materials/hazardous wastes (HM/HW).

B. MAJOR FINDINGS

Past Base operations involved the use and disposal of materials and wastes that subsequently were categorized as hazardous. The major operations of the 162nd TFG that have used and disposed of these materials and wastes are aircraft maintenance, aerospace ground equipment maintenance, ground vehicle maintenance, and petroleum, oil, and lubricant (POL) management and distribution. These operations involve corrosion control, nondestructive inspection, fuel cell maintenance, and engine maintenance. Waste oils, recovered fuels, spent cleaners, strippers, and solvents were generated by these activities.

Interviews with 28 Base personnel and a field survey resulted in the identification of eight disposal and/or spill sites at the Base that are potentially contaminated with HM/HW. These sites were assigned a Hazard Assessment Score (HAS) according to the U.S. Air Force Hazard Assessment Rating Methodology (HARM):

Site No. 1 - Old Fire Training Area (HAS-63)

This fire training area (FTA) consists of three unlined pits. It is estimated that several thousand gallons of JP-4 were released at the site from the late 1950s to 1965. Solvents and oils were also released.

Site No. 2 - Solvent Dumping Area - East Fence Line (HAS-66)

This site was reportedly used to dump residual oils and waste trichloroethylene (TCE) and PD-680 solvents from the late 1950s to 1972. It is estimated that a total of 1,300 to 1,500 gallons was released at this site.

Site No. 3 - Storm Drain Discharge Point - Gatehouse (HAS-81)

Storm water from a large portion of the Base discharges at this point into Airport Wash, a major tributary of the Santa Cruz River. Effluent from the Hush House oil/water separator, JP-4 spills from the aircraft parking apron, and POL overflows from the bulk fuels facility are also channelled to this site. Some solvents may have also reached this point via an old washrack drain. During the site visit, the HMTC team noted oil discharging at this site.

Site No. 4 - Base Parking Lot - West (HAS-69)

Oil was occasionally spread on this unpaved base parking area for dust suppression purposes. The oils used here were derived from various used-oil-generating shops and oil/water separators. It is likely that dust suppression oils contained some amount of solvent.

Site No. 5 - Old Wash Rack Area (HAS-51)

From 1959 until 1985, this site served as a wash rack for the engine shop and other aircraft maintenance shops. Strong POL odors were noted in excavated soil during new construction at this site, suggesting the presence of leaks in underground storm or sanitary sewer lines connected to the wash rack. Other contaminants at this site may include PD-680 solvent, TCE, and oils.

Site No. 6 - Solvent Dumping Area (HAS-59)

Until 1977, used solvents were dumped along a fence line area and ravine between Buildings 41 and 44. A total of 400 to 1,000 gallons of TCE solvent was released at this site.

Site No. 7 - Edges of Aircraft Parking Apron (HAS-65)

Residual solvents and oils were occasionally spread along the edges of the aircraft parking apron for weed control. These solvents include PD-680 and TCE. Some JP-4 spillage may have also washed onto the edges of the parking apron.

Site No. 8 - POL Area (HAS-54)

Occasional tank truck overfills reportedly occur at the Base POL area. A portion of these JP-4 spills flow into storm sewers, but much is absorbed by soils bordering the POL area.

Groundwater in the upper, unconfined aquifer beneath the Base is susceptible to contamination. The water table is approximately 80 feet below the land surface. The aquifer is composed of permeable sands, sandy clays, and clayey sands. Because most surface runoff quickly percolates through the soil, surface pollutants discharged onto the ground or into surface drainage can enter the groundwater with infiltrating rainfall.

C. CONCLUSIONS

Information obtained through interviews with Base personnel resulted in the identification of eight disposal and/or spill sites on the Base that are potentially contaminated with HM/HW. At each of the identified sites, the potential exists for contamination of groundwater and subsequent contaminant migration. Each of the eight sites was assigned a HAS according to HARM.

The most like likely receptors of contaminated groundwater are consumers of Base drinking water, which is derived from a well centrally located on the Base. Nearby residents tapping the uppermost aquifer also may be possible receptors.

D. RECOMMENDATIONS

Because the potential exists for contamination of groundwater and migration of contaminants from the eight identified sites at the Base, initial investigative stages of the IRP Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS) are recommended. The primary purposes of subsequent investigations are:

1. To determine whether pollutants are or are not present at each site, and

2. To determine whether groundwater underlying the Base has been contaminated by the identified sites, and if so, to quantify the contaminant concentrations, the rate and direction of migration, and identify the boundaries of the contaminant plume and its proximity to potential receptors.

Because previous investigations of the Tucson airport area have revealed trichloroethylene (TCE) contamination in groundwater in the upper, unconfined aquifer, additional IRP investigations may be needed to determine if the contaminated groundwater is migrating beneath the Base from other sources.

I. INTRODUCTION

A. Background

The 162nd Tactical Fighter Group (TFG) is located at the Arizona Air National Guard Base, Tucson International Airport, Tucson, Arizona (hereinafter referred to as the Base). The TFG was established in June 1958. Past Base operations involved the use and disposal of materials and wastes that subsequently were categorized as hazardous. Consequently, the National Guard Bureau has implemented an Installation Restoration Program (IRP) consisting of the following:

Preliminary Assessment (PA) - Records Search to identify past spill or disposal sites posing a potential and/or actual hazard to public health or the environment.

Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS) - to acquire data via field studies for the confirmation and quantification of environmental contamination that may have an adverse impact on public health or the environment; to prepare a Feasibility Study; and, where required, to develop a Remedial Action Plan (RAP).

Research, Development, and Demonstration (RD&D) - if needed, to develop new technology for accomplishment of remediation.

Remedial Design/Remedial Action - to implement a site remedial action.

B. Purpose

The purpose of this IRP PA - Records Search (hereinafter referred to as Records Search) is to identify and evaluate suspected problems associated with past waste handling procedures, disposal sites, and spill sites on the Base. The Hazardous Materials Technical Center (HMTC) visited the Base, reviewed existing environmental information, analyzed the Base records concerning the use and generation of hazardous materials/hazardous waste (HM/HW), and conducted interviews with Base personnel who are familiar with past HM/HW management activities. Relevant information collected and analyzed as part of the Records Search included a history of the Base, with special emphasis on the history of the shop operations and their past HM/HW management procedures; the local geological, hydrological, and meteorological conditions that may affect migration of contaminants; the local land use, public utilities, and zoning requirements that affect the potential for exposure to contaminants; and the ecological settings that indicate the environmentally sensitive habitats or evidence of environmental stress.

C. Scope

The scope of this Records Search is limited to spills, leaks, or disposal activities that occurred on Base property or on property used solely by the Base in the past, and includes:

- An onsite visit;
- The acquisition of pertinent information and records on hazardous materials use and hazardous waste generation and disposal practices at the Base;
- The acquisition of available geologic, hydrologic, meteorologic, land use and zoning, critical habitat, and utility data from various Federal, State, and local agencies;
- A review and analysis of all information obtained; and
- The preparation of a report to include recommendations for further actions.

The onsite visit and interviews with past and present personnel were conducted during the period 13-17 April 1987. The Preliminary Assessment - Records Search was conducted by Mr. Jeffrey J. Spann, Environmental Scientist (B.S., Chemistry, 1969), Mr. Eric A. Kuhl, Staff Scientist (B.A., Political Science/Environmental Policy, 1982), Ms. Janet Emry, Hydrogeologist (M.S., Geology, 1987), Mr. Mark D. Johnson, Geologist (B.S., Geology, 1980), and Mr. Raymond G. Clark, Jr., Program Manager (B.S., Mechanical Engineering, 1949) (Appendix A). Individuals from the Air National Guard who assisted in the Records Search include Mr. Henry H. Lowman, P.E., ANGSC, Primary Project Officer, and selected members of the 162nd TFG. The Point of Contact (POC) at the Base was Capt. Raymond Willcocks, Assistant Base Civil Engineer.

D. Methodology

A flow chart of the Records Search Methodology is presented in Figure 1. This Records Search Methodology ensures a comprehensive collection and review of pertinent site-specific information, and is used in the identification and assessment of potentially contaminated hazardous waste spill/disposal sites.

The Records Search began with a site visit to the Base to identify all shop operations or activities on the installation that may have used hazardous materials or generated hazardous wastes. Next, an evaluation of past and present HM/HW handling procedures at the identified locations was made to determine whether environmental contamination may have occurred. The evaluation of past HM/HW handling practices was facilitated by extensive interviews with 28 past and present employees familiar with the various operating procedures at the Base. These interviews also defined the areas on the Base where any waste materials, either intentionally or inadvertently, may have been used, spilled, stored, disposed, or released into the environment.

Appendix B lists the interviewees' principal areas of knowledge and their years of experience with the Base. Historical records contained in the Base's files were collected and reviewed to supplement the information obtained from interviews. Using the information outlined above, a list of past waste spill/disposal sites on the Base were identified for further evaluation. A general survey tour of the identified spill/disposal sites, the Base, and the surrounding area was conducted to determine the presence of visible contamination and to help the HMTC survey team assess the potential for contaminant migration. Particular attention was given to locating nearby drainage ditches, surface water bodies, residences, and wells.

Detailed geological, hydrological, meteorological, developmental (land use and zoning), and environmental data for the area of study also were obtained from the POC and from appropriate Federal, State, and local agencies. The out-

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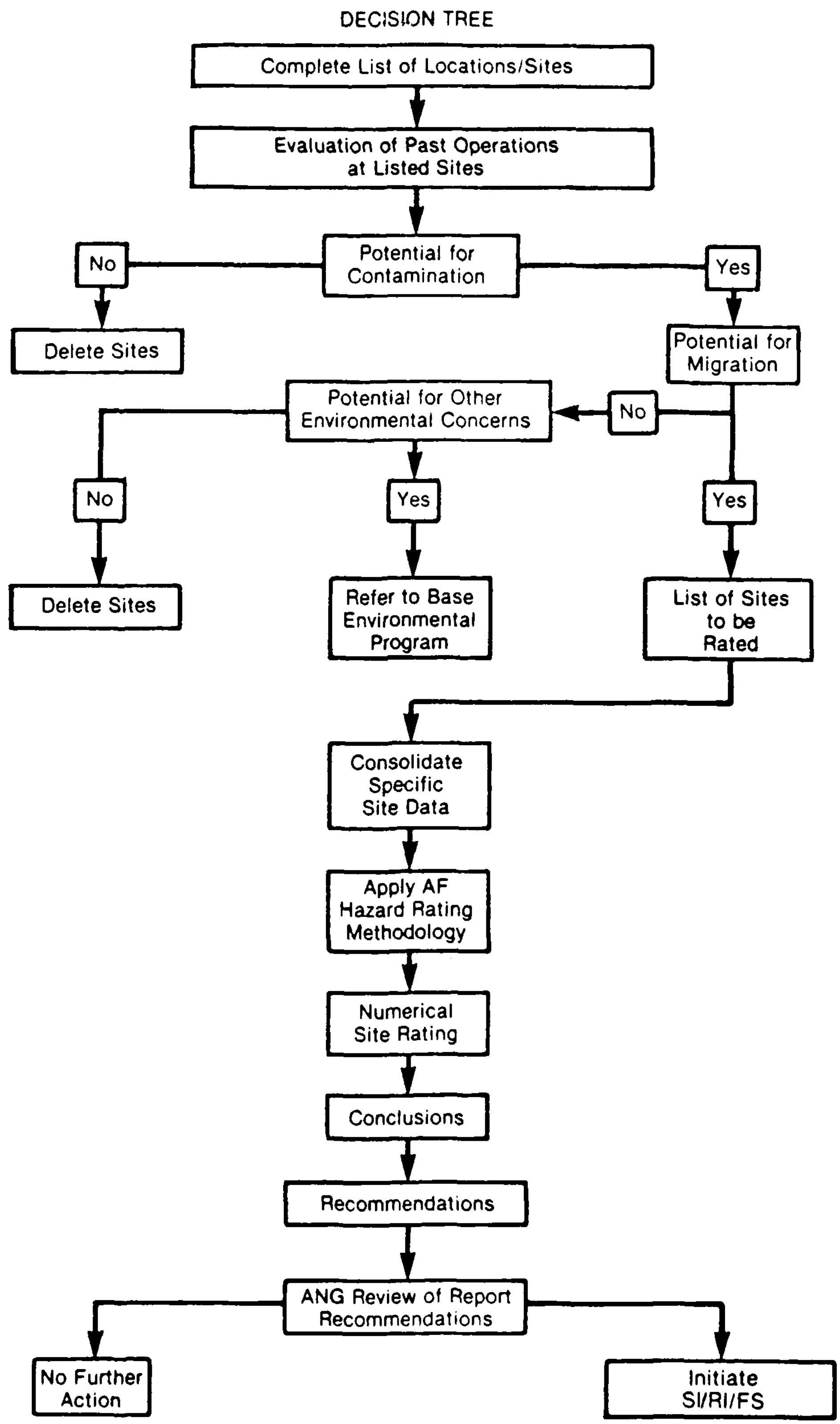
Figure 1. Records Search Methodology Flow Chart.



side agencies that furnished information or were contacted are identified in Appendix C. Following a detailed analysis of all the information obtained, it was determined that eight sites are potentially contaminated with HM/HW and the potential for contaminant migration exists. Where sufficient information was available, sites were assigned a Hazard Assessment Score (HAS) according to the U.S. Air Force Hazard Assessment Rating Methodology (HARM).

II. INSTALLATION DESCRIPTION

A. Location

The Arizona Air National Guard, 162nd TFG, is located at Tucson International Airport, Tucson, Arizona. The Base occupies 84 acres in the northwestern portion of the airport, immediately south of the city of Tucson. Figure 2 shows the location and boundaries of the Base property covered by this Records Search.

The area immediately north and west of Tucson International Airport and the Base is primarily residential, with numerous subdivisions and small businesses. The San Xavier Indian Reservation to the west is largely composed of undeveloped desert areas and widely scattered domestic housing. Areas south and east of the airport are also largely undeveloped. Numerous industries are located in the vicinity of the airport, the largest of which is the Hughes Aerospace Corporation, an Air Force contractor.

B. Organization and History

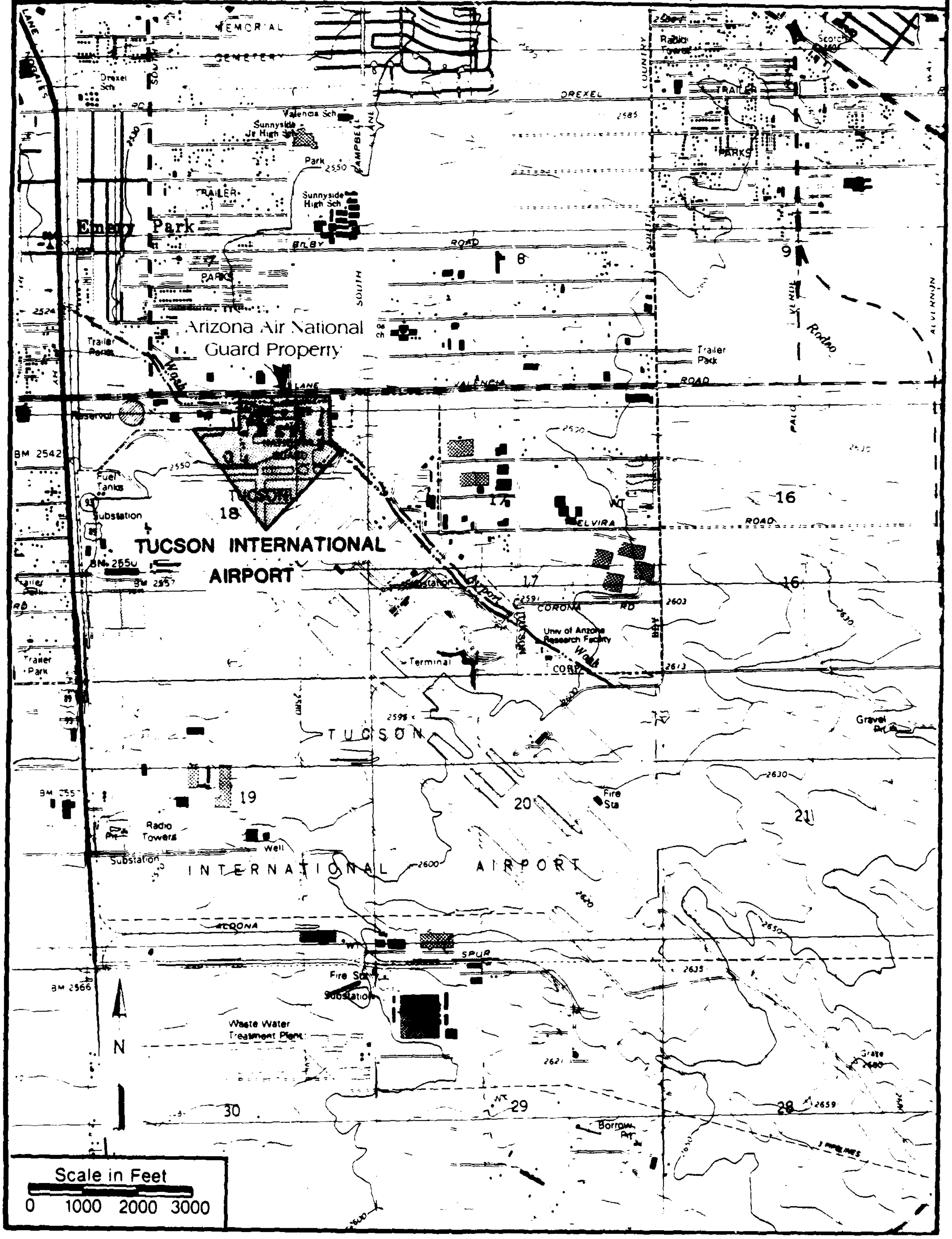
The 152nd Observation Squadron, which originated with the Rhode Island National Guard in 1939, was formally allocated to the State of Arizona on 1 May 1956, as the 152nd Fighter Interceptor Squadron. Flight activities began at Tucson on 27 June 1956, with the F-86A aircraft. In 1957, a transition was made to the F-84. The 152nd achieved Group status in 1958 and became the 162nd Fighter Group, receiving supersonic F-100 aircraft. In 1969, the unit became the 162nd Tactical Fighter Training Group and began training pilots from all over the nation. The 162nd began dual training for both the F-100 and A-7D aircraft in 1977, and by 1978 were training for only the A-7Ds. During this time, the 162nd was officially designated the 162nd TFG and undertook four separate training missions: the Basic Course, the Instructor Pilot Upgrading Course, the A-7D Conversion Course, and the Fighter Weapons School. In 1986, the Base added 24 F-16 jets to its existing force of 42 A-7Ds.

HMTD

Source: Adapted from: USGS Topographic Map, Tucson and Tucson SW, Arizona, 7.5 minute Series.

Figure 2.

Location Map of Arizona Air National Guard, Tucson International Airport, Tucson, Arizona.



III. ENVIRONMENTAL SETTING

A. Meteorology

The climate of the Tucson basin is semiarid. Precipitation varies from year to year, but averages about 11 inches annually. More than half of the annual precipitation falls between July and September. Net precipitation is negative 55 inches per year, according to the method outlined in the Federal Register (47 FR 31224, 16 July 1982). Rainfall intensity, based on 1 year, 24-hour rainfall, is 1.6 inches (calculated according to 47 FR 31235, 16 July 1982, Figure 8). The average annual air temperature at Tucson is 67° to 70° F and the average frost-free period is 260 to 280 days.

B. Geology

The Tucson basin is part of the Basin and Range physiographic province, which is characterized by isolated fault-block mountains separated by broad, down-dropped basins filled with mountain-derived alluvium. The basins range in elevation from 2,100 to 4,700 feet above sea level, while the mountains are as much as 9,400 feet above sea level. The city of Tucson is centrally located within the Tucson basin, which covers an area of 1,000 square miles.

The mountains that border the Tucson basin to the northwest are composed of Precambrian metamorphic rocks, and Cretaceous and Tertiary igneous intrusive plugs. The mountains to the southeast are composed of sedimentary rocks, volcanic flows, and ash formations of Mesozoic age, as well as Cretaceous igneous intrusive plugs.

The Base is underlain by unconsolidated and semiconsolidated alluvium to depths of several thousand feet. The lowermost formation within the basin is the Oligocene Pantano Formation. This unit is composed of gravel, mudstone, and gypsiferous mudstone, and ranges in thickness from 200 feet near the edge of the basin to 1,000 feet in the center of the basin.

The Miocene/Pliocene Tinaja Formation overlies the Pantano Formation. The Tinaja is composed of up to 5,000 feet of gravel, gypsiferous clayey silt and mudstone, and volcanic flows and ash units. The finer sediments, such as the silt and mud units, occur near the center of the basin.

Overlying the Tinaja Formation is the Pleistocene Fort Lowell Formation, consisting of 300 to 400 feet of unconsolidated sand and gravel near the edge of the basin and clayey gravel, silt, and clay toward the center of the basin.

The surficial deposits include Recent unconsolidated gravel, sand, and sandy silts associated with major fluvial channels. These sediments range in thickness from 20 to more than 100 feet.

C. Soils

According to the U.S. Soil Conservation Service, the soils at the Base consist primarily of the Sahuarita-Mohave complex, with minor amounts of the Cave series. About 45 percent of these units is Urban land, areas of land so altered by construction or obscured by structures that identification of the soil is difficult or impossible.

The Sahuarita soil forms in alluvium on fan terraces with slopes of 1 to 5 percent and is deep and well drained. The surface layer of the Sahuarita soil is a light yellowish-brown, very gravelly fine sandy loam about 3 inches thick. The subsoil is light yellowish-brown, fine sandy loam, 25 inches thick, underlain by a buried subsoil of brown clayey loam, 17 inches thick and brown very gravelly sandy loam to 60 inches or more. Fine lime filaments occur in the buried subsoil. Permeability of the Sahuarita soil is moderate (4.2×10^{-4} cm/sec) to a depth of 28 inches and moderately slow (1.4×10^{-4} cm/sec to 4.2×10^{-4} cm/sec) below this depth. The hazard of water erosion is high.

The Mohave soil forms in alluvium on fan terraces with slopes of 1 to 3 percent and is deep and well drained. The surface layer of the Mohave soil is brown sandy loam, 3 inches thick. The upper 5 inches of the subsoil is brown sandy clay loam; the next 13 inches is brown and light brown clay loam; and the lower 16 inches is reddish-brown, light reddish-brown, and pink sandy clay loam. The substratum, to a depth of 60 inches or more, is light reddish-brown and white loam. Soft masses of lime occur in the lower part of the subsoil and in the substratum. Permeability of the Mohave soil is moderately slow (1.4×10^{-4} cm/sec to 4.2×10^{-4} cm/sec) and the hazard of water erosion is moderate.

The Cave soil forms on old fan terrace remnants, with 0 to 8 percent slopes and is shallow and well drained. The surface layer of the Cave soil is a light brown, gravelly fine sandy loam, about 7 inches thick. The subsoil is a pinkish white, gravelly fine sandy loam, 5 inches thick. A white indurated lime hardpan (caliche) occurs at depths ranging from 4 to 20 inches. Below the caliche is light brown, weakly cemented, gravelly loamy sand to 60 inches. Permeability at the Cave soil is moderate (4.2×10^{-4} cm/sec to 1.4×10^{-3} cm/sec) and the hazard of water erosion is moderate.

D. Hydrology

Surface Waters

The Santa Cruz River, which is dry much of the year, flows northward along the western side of the city of Tucson (2.43 miles west of the Base) and drains the entire city. Airport Wash, a major tributary of the Santa Cruz River, is also usually dry and forms a part of the northern and eastern boundaries of the Base. Airport Wash has been realigned and widened to carry a maximum flow of 4,000 ft^3/sec, equal to the 100-year flood. Most storm drainage from the Base, and from much of the airport, flows into Airport Wash, including effluent from the Hush House oil/water separator (OWS). Some storm runoff flows into a grate inlet at the wash rack; this runoff is discharged to an OWS and then to the sanitary sewer. Approximately 75 percent of the storm runoff which reaches Airport Wash infiltrates into the soil and recharges groundwater supplies. Any surface pollutants discharged into waterways or on the ground can also enter the groundwater easily with the infiltrating rainfall (Master Plan, 1985).

Groundwater

The city of Tucson, with a population of approximately 520,000, is solely dependent on groundwater for its municipal water. The Base also obtains its potable water from groundwater supplies. The aquifer systems in the Tucson area are composed of basin fill sediments. In the vicinity of the Base, the aquifer system is known as the "regional divided aquifer", consisting of an upper aquifer zone, a lower aquifer zone, and an aquitard which divides the two. Approximately 1.8 miles west of the Base, the aquitard pinches out, and as a result, the regional aquifer is undivided to the west. Some localized perched water table systems are found above the water table of both the undivided and divided regional aquifers.

The upper aquifer in the vicinity of the Base consists of Recent sands, sandy clays, and clayey sands that extend to a depth of 140 feet below the land surface. The aquitard, part of the Pleistocene Fort Lowell Formation, is composed of a complex series of clay beds. This unit, 220 feet thick beneath the Base, thins to less than 10 feet toward its northern and western boundaries. The aquitard limits the hydraulic connection between the upper and lower aquifer zones (Mock and others, 1985). The lower aquifer is composed of clayey sand with lenses of gravelly sand and sandy clay and extends from approximately 370 feet below the land surface to an unknown depth. This unit probably includes both the lower Fort Lowell Formation and the underlying Miocene/Pliocene Tinaja Formation.

Groundwater in the upper aquifer zone occurs under unconfined conditions, and is encountered at a depth of approximately 80 feet below the land surface at the Base. Flow is toward the north-northwest, with a hydraulic gradient of 22 feet/mile. The average hydraulic conductivity of the upper aquifer near the Base is 6.61×10^{-2} cm/sec, and the average rate of flow is an estimated 710 feet per year (Mock and others, 1985). Groundwater in the lower aquifer zone occurs under confined conditions, with flow toward the northwest Hydraulic conductivities should be similar to those of the upper aquifer. The Base derives its water from a 402-foot well, which is screened in both the confined and unconfined portions of the aquifer. Wells supplying water to a trailer park community adjacent to the Base also draw upon the unconfined aquifer. Hydrologic investigations of the airport area indicate that the upper unconfined aquifer is contaminated with trichloroethylene (TCE). The main plume of TCE pollution is west of the Base, extending about 4.3 miles to the northwest from the Hughes Aerospace Corporation facility. Two smaller plumes are present east of the main plume: one near the Base and one near the Burr-Brown and West-Cap Arizona facilities. These small plumes contain less than 50 parts per billion of TCE and are of limited areal extent (Schmidt, 1985). Water from both the Base well and the nearby trailer park well contain low concentrations of TCE. Because of this contamination, the Base well has been closed and the Base is currently using municipal drinking water supplies. Plans are under way to add a carbon filtration system to the Base water storage tower to reduce TCE concentrations and allow continued use of the Base well. Without further investigation, the source of underlying groundwater contamination cannot be determined, especially given the numerous hazardous waste generating industries present within the entire airport complex.

E. Critical Habitats/Endangered or Threatened Species

According to the Base Master Plan and the Arizona Game and Fish Commission, no naturally occurring threatened or endangered species normally occur on or in the vicinity of the Base due to its location within the environs of the city of Tucson and its small size. Neither are there critical habitats, wetlands, or wilderness areas in the vicinity of the Base.

IV. SITE EVALUATION

A. Activity Review

A review of Base records and interviews with past and present Base employees resulted in the identification of specific operations in which industrial chemicals are handled and hazardous wastes can be generated. Table 1 summarizes these major operations, provides estimates of the quantities of waste currently being generated by these operations, and describes the past and present disposal methods for the wastes. Based on information gathered, any operation that is not listed in Table 1 has been determined to produce negligible quantities of wastes ultimately requiring disposal.

B. Disposal/Spill Site Identification, Evaluation, and Hazard Assessment

Interviews with 28 Base personnel (Appendix B) and subsequent site inspections resulted in the identification of 8 waste disposal/spill sites which are potentially contaminated with HM/HW. Each of the eight sites was scored using HARM (Appendix D). Copies of completed Hazard Assessment Rating Forms are included in Appendix E. Table 2 summarizes the Hazard Assessment Scores (HAS) for the scored sites and Figure 3 illustrates the location of the sites.

Each of the identified sites exhibits a potential for contaminant migration. Potential contamination of groundwater underlying the Base is the primary threat posed by these sites. Surficial soils and the uppermost basin sediment deposits underlying the Base are relatively permeable, and must be assumed capable of absorbing and transporting surface precipitation into groundwater. Base soil borings and well logs show the presence of clay lenses near the surface at the Base; however, because the lenses are not known to occur uniformly, their efficiency in limiting downward percolation of precipitation is thought to be limited. Groundwater underlying the Base occurs under unconfined and confined conditions. Although the water table at the Base occurs at a depth of approximately 80 feet below land surface, surface contaminants could

Table 1. Hazardous Waste Disposal Summary: Arizona Air National Guard, Tucson International Airport, Tucson, Arizona

Shop Name	Building No.	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1957 1967 1977 1987
Photo Lab	9	Fixer	50	SIL REC
		Developer	50	SAN
Weapons Release	41	TCE	450	STORM — DRMO
		PD 680	30	CONTR — DRMO
Hydraulics Shop	9	Hydraulic Fluid	480	[FTA / SAN / GRND] — DRMO
		PD-680	900	SAN — DRMO
		TCE	2	SAN — DRMO
		Denatured Alcohol	2	SAN — DRMO
Field Maintenance	9	TCE	1	SAN — DRMO
		Trichloroethane	1	SAN
		Toluene	2	SAN
		Carbon Tetrachloride	4	[SAN / GRND]
Gun Shop	41,33	PD 680	110	[SAN / GRND] — DRMO
Aircraft Maintenance	9	PD-680	300	SAN
		Engine Oil	400	[FTA / GRND] — DRMO
		JP-4	78	FTA — [DRMO / FTA]
		TCE	3	SAN — DRMO

SIL REC - Sent for silver recovery offbase
SAN - Disposed of in drains leading to sanitary sewer
STORM - Disposed of in drains leading to storm sewer
DRMO - Disposed of through the Defense Reutilization and Marketing Office
CONTR - Disposed of through Hazardous Waste Contractor

FTA - Burned at Fire Training Area
GRND - Disposed of on ground
LNDFL - Landfilled offsite
SPLY - Turned into base supply for recovery
NEUTR SAN - Neutralized and disposed of through sanitary sewer

Table I. Hazardous Waste Disposal Summary: Arizona Air National Guard, Tucson International Airport, Tucson, Arizona (Continued)

Shop Name	Building No.	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1957 – 1967 – 1977 – 1987
Vehicle Maintenance	27	JP 4	90	FTA — DRMO
		Transmission Fluid	600	[CONTR, GRND] — DRMO
		Used Oil	420	[CONTR, GRND] — DRMO
		Used Batteries	25 units	SPLY — DRMO
		Electrolyte	6	GRND — NEUTR SAN
Wheel and Tire	27,9	PD-680	48	SAN
Avionics	49	TCE	52	GRND — DRMO
		Paint Thinner	4	GRND — DRMO
Aerospace Ground Equipment	48	PD 680	420	SAN — DRMO
		Used Oil	330	GRND — DRMO
		Used Batteries	24 units	SPLY — DRMO
Non Destructive Inspection	33	Developer	60	NEUTR SAN
		Fixer	60	SIL REC
Engine Shop	33	Used Oil	720	[FTA, CONTR, GRND] — DRMO
		PD 680	240	[FTA, CONTR, GRND] — DRMO
		JP 4	60	FTA
Munitions	41	TCE	200	[GRND, FTA, CONTR] — DRMO
		PD 680	200	SAN
		Caustic Soda	660	NEUTR SAN
		Paint Remover	60	SAN

Table 1. Hazardous Waste Disposal Summary: Arizona Air National Guard, Tucson International Airport, Tucson, Arizona (Continued)

Shop Name	Building No.	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1957 1967 1977 1987
Electrical Shop	9	"Nickad" Batteries	120 cells	DRMO
		Batteries (Lead Acid)	60	DRMO
		Electrolyte	60	NEUTR SAN
Fuels	30	JP-4	1,500	FTA

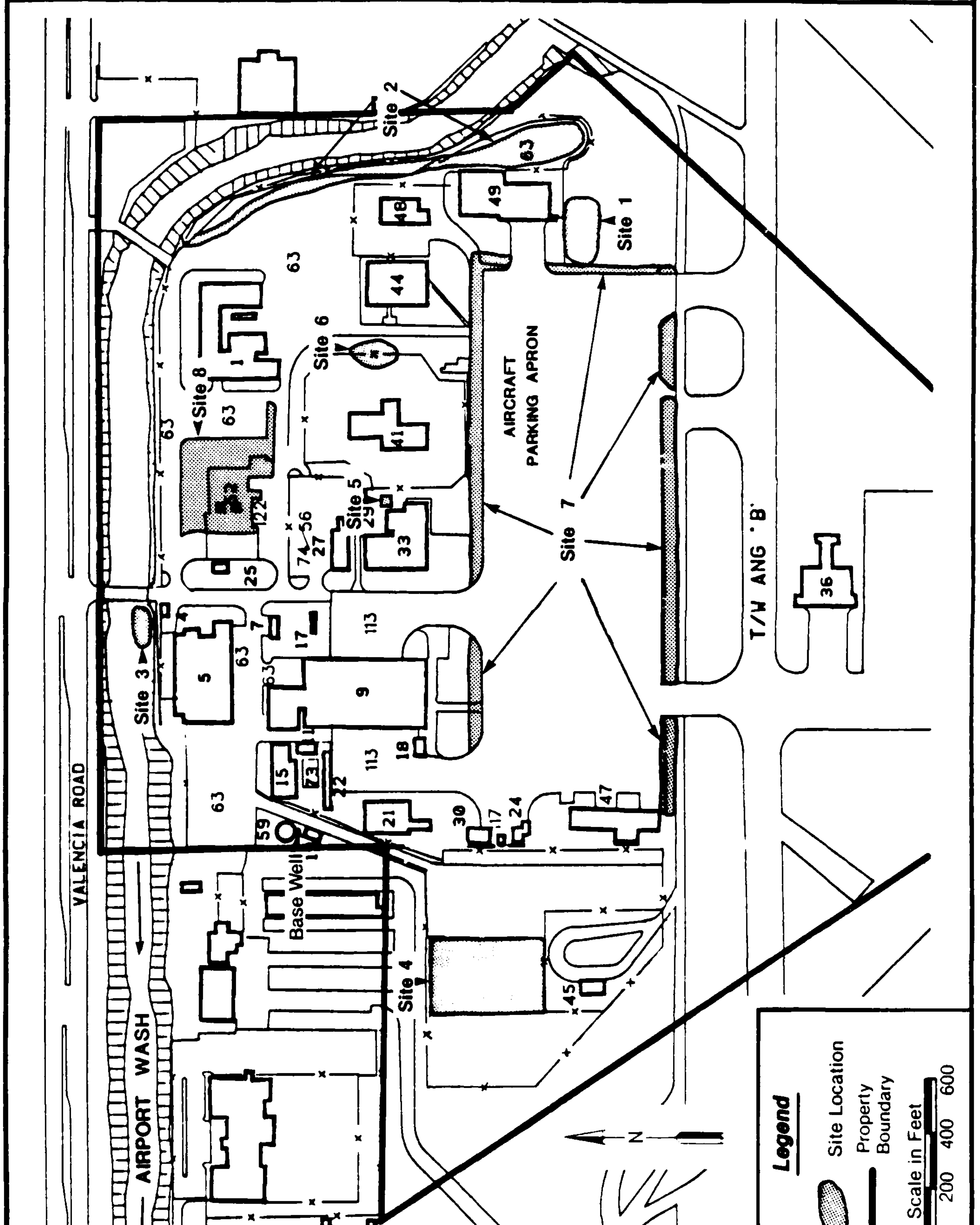
Table 2. Site Hazard Assessment Scores (as Derived from HARM): Arizona Air National Guard, Tucson International Airport, Tucson, Arizona

Site Priority	Site No.	Site Description	Receptors	Waste Characteristics	Pathway	Waste Mgmt. Practices	Overall Score
1	3	Storm Drain Discharge Point - Gate-House	62	100	80	1.0	81
2	4	Base Parking Lot - West	62	90	56	1.0	69
3	2	Solvent Dumping Area - East Fence Line	62	80	56	1.0	66
4	7	Edges of Air-craft Parking Apron	58	80	56	1.0	65
5	1	Old Fire Train-ing Area	62	72	56	1.0	63
6	6	Solvent Dumping Area	62	60	56	1.0	59
7	8	POL Area	62	50	56	1.0	54
8	5	Old Wash Rack Area	58	40	56	1.0	51

HMTC

Source: Arizona Air National Guard. Real Estate Map. 1986

Figure 3.
Location of Sites at Arizona Air National Guard, Tucson International Airport, Tucson, Arizona.



potentially reach this level and thereby threaten wells drawing on the unconfined aquifer.

Site No. 1 - Old Fire Training Area (HAS-63)

From the late 1950s until 1965, fire training exercises were conducted at three open, unlined pits located at the south end of where Building 49 now stands. Today the area is covered with dirt and natural "desert pavement" and there is no visible evidence of the pits. Two to three drums of JP-4, PD-680, solvents, and oils were released during fire training exercises at the old fire training area. Fire training exercises occurred 1 or 2 times per month. Up to 12,500 gallons of hazardous liquids may have been released at the old fire training area during its operating lifespan. If all but 10 to 20 percent of the liquid was burned, between 1,250 and 2,500 gallons of flammable liquid may remain at this site. A HAS was applied to this site because of potential threats to underlying groundwater.

Site No. 2 - Solvent Dumping Area - East Fenceline (HAS-66)

Interviewees reported that small amounts of residual oils and waste solvents, including PD-680 and TCE, were frequently dumped at this site in the past. Solvents have not been released at this site since 1972. From the late 1950s until 1972, approximately 100 gallons of parts-cleaning solvents were released at this site each year, for a total of between 1,300 to 1,500 gallons of solvents. Also, used oil was reportedly spread at places on the Base for dust suppression. This site, a portion of which is now a paved parking lot, was reported as an area where oiling occurred.

Oil used for dust suppression was derived from various used-oil generating shops including aerospace ground equipment, vehicle maintenance, and some aircraft maintenance shops. Also, in the late 1950s and early 1960s, waste oil derived from OWSs was used for dust suppression. It is probable that oil derived from OWSs contained some amount of solvent, since solvents were reportedly released into shop or wash rack drains connected to separators. Given the common past shop practices of commingling small amounts of waste solvent in waste oil drums, it is likely that dust suppression oils from shops also contained some solvents.

Because of Tucson's arid environment and characteristically high temperatures, much of the solvent discarded at this site probably volatilized shortly after release or was dispersed as wind-blown dust. However, contaminated soils may remain at this site and could pose potential threats to underlying groundwater as a result of contaminant leaching during periods of precipitation.

This site is located along the southern bank of Airport Wash. Potentially contaminated runoff or erosionally transported soils from this site may enter Airport Wash. Sediment beds of basin washes, such as Airport Wash, are the most permeable surface geology in the Tucson Basin; therefore, washes represent a likely contaminant transport pathway to underlying unconfined groundwater. Because Airport Wash flows only during rainy periods, contaminants reaching the wash are not readily transported downstream and dispersed, except in instances of sustained rain. Rather, contaminants tend to settle near where they enter the wash and subsequently percolate downward, possibly to underlying aquifers. A HAS was applied to quantify the potential hazard presented by this site.

<u>Site No. 3 - Storm Drain Discharge Point, Gatehouse</u> (HAS-81)

During their site tour, the HMTC team noted oil flowing from a main storm water drainage pipe discharging into Airport Wash. The discharge point is located adjacent to the main entrance gatehouse (Building 4). Together with Base civil engineering personnel, the HMTC team determined a possible source of contamination to be drainage from a storm sewage inlet near the vehicle maintenance washrack. Vehicle maintenance personnel reported that since 1980, waste oils have been disposed of through the Defense Reutilization Marketing Office (DRMO) and not through storm sewers; thus, oil at the discharge point may have been the result of an accidental release. However, the Base Master Plan, published in 1985, indicates that effluent from the Hush House OWS is discharged to this storm sewer line. Hush House effluent then may be a source of contamination. The Base Master Plan also identified oil discharges at this site, which suggests possible chronic contaminant discharges.

Storm water from the majority of central and western portions of the Base and from a significant portion of airport property discharges at this point. Consequently, any flightline spills or spills at the POL area that enter the storm drainage system would be routed to this point. Occasional tank truck overfills reportedly occur at the POL facility that sometimes result in the release of up to 200 to 300 gallons of fuel. Portions of these spills, which reportedly occur 1 or 2 times per year, may enter storm drains which discharge into Airport Wash at this site. In 1983, a JP-4 spill occurred on the aircraft parking apron; estimates of the spill size vary between 300 and 500 gallons. The spill was washed from the parking apron with water and into storm drains leading to the gatehouse discharge point.

Numerous interviewees reported that small amounts of solvents and oils were occasionally released along the edges of the aircraft parking apron for weed control (see Site No. 7). Although much of this may have evaporated or remained where it was discarded, it is likely that a portion of these discarded contaminants entered the Base storm drainage system via sheet flow runoff from the aircraft parking apron and were discharged at this site.

Contaminants released at Site No. 5 wash rack also were routed to the gatehouse discharge point. Wastes from the wash rack included PD-680 solvent, TCE, and some oils. The Site No. 5 wash rack operated from 1959 until 1985, although from 1980 until 1985, the wash rack was connected to an OWS. It is estimated that up to 8,500 gallons of wash rack wastes may have been released at the gatehouse discharge point.

Because Airport Wash remains dry except during rainy periods, contaminants discharging into the wash will tend to percolate into wash sediments or evaporate; they do not flow away from the discharge point except during heavy rains. Permeable sediment beds of basin washes, such as Airport Wash, represent a likely contaminant transport pathway to underlying groundwater. Likely receptors of potential contamination in underlying groundwater are consumers of Base well water and nearby residents drawing upon the unconfined aquifer sources. Due to the evidence of past contaminant releases at this site, HAS application was considered necessary.

Site No. 4 - Base Parking Lot, West (HAS-69)

Base personnel reported that used oil was occasionally spread on this unpaved base parking area for dust suppression purposes. Oil used for dust suppression was derived from various used oil generating shops including aerospace ground equipment, vehicle, and aircraft maintenance shops. Also, from the late 1950s until early 1960s, used oils derived from OWSs were used for dust suppression at this site and at some other locations on the base. Use of oils for dust suppression was discontinued around 1980.

It is probable that oil derived from oil/water separators contained some amount of solvents; also, given the common past shop practices of commingling small amounts of waste solvents in waste oil drums, it is likely that dust suppression oil from shops also contained some solvent products. Due to the potential threats posed to groundwater underlying the Base, a HAS was applied at this site. HAS calculations were based on the assumption that a "large" quantity of contaminants (4,000 gallons or more) was released at this site. Estimates obtained from the vehicle maintenance shop, engine shop, and other aircraft maintenance shops attribute between 10,000 and 19,000 gallons of used oil to dust suppression purposes. This figure suggests that, over a 20-year period, between 40 and 80 gallons of used oil per month were used for dust suppression at this site and perhaps at other sites (primarily Site No. 2) on the Base. Probably much of the oil was eventually dispersed as wind-blown dust. If the oil contained solvents, much of these were also either dispersed by wind or volatilized. However, some oils and solvent products may remain at this site and pose potential threats to human health or the environment.

Site No. 5 - Old Wash Rack Area (HAS-51)

This site, located on the east corner of Building 33, previously served as a wash rack for the engine shop and other aircraft maintenance shops. The wash rack was used from 1959 until 1985. From 1980 until 1985, the site was connected to an OWS which discharged into the sanitary sewer system. Prior to 1980, the wash rack discharged into Airport Wash at the Base Gatehouse (Site No. 3). Although the majority of wastes from the wash rack was channelled away from this site, interviewees reported the presence of strong POL odors in soil excavated during construction operations at this site. The reports suggest that leaks may have occurred in underground storm or sanitary sewage piping connected to the wash rack, and that contaminants may be present in underlying soils. Wastes disposed of at this site include PD-680 solvent, TCE, and some oils. Because the majority of contaminants dumped at the wash rack were routed away from the site, the exact quantity of contaminants released cannot be determined. However, given first hand accounts of odorous contaminants, a HAS was necessary. HAS calculations were based on a "small" quantity release (1,000 gallons or less).

Site No. 6 - Solvent Dumping Area (HAS-59)

Until 1977, used solvents were dumped along a fence line and ravine running between Buildings 41 and 44. Each month, 2 to 5 gallons of TCE solvent was reportedly disposed of along the fence or onto the ravine bank. An estimate of the total amount of TCE released at this site is from 400 to 1,000 gallons. Because only small amounts of solvent were discarded here at any one time, the majority of the contaminants probably evaporated shortly upon release. However, because some solvent may still be present in the soils at this site, a HAS was calculated.

Site No. 7 - Edges of Aircraft Parking Apron (HAS-65)

Numerous interviewees reported that solvents and used oils were occasionally spread along the edges of the aircraft parking apron for weed control. This disposal method was not part of a sanctioned weed eradication program; rather, such disposal was practiced by shop personnel on a random basis as a way to dispose of small amounts of residual solvents. Consequently, this site encompasses a large area including the northern, eastern, and western edges of the aircraft parking apron nearest to many industrial and maintenance shops. Because individual releases consisted of only small amounts (several ounces to 1 quart) that were not concentrated in any specific area, it is doubtful that contaminants would be present in high concentrations. Types of solvents discarded along the parking apron consist mainly of PD-680, but also include TCE.

Other potential sources of contamination along the edge of the parking apron include a 200- to 300-gallon JP-4 spill that occurred on the apron in 1983. Much of the spillage was washed into the storm drainage system, but some reportedly washed onto the northern edge of the aircraft parking apron.

Because contaminants from solvent and fuel releases may still be present in soils bordering the parking apron, a HAS was applied on the basis of a "medium" quantity release.

Site No. 8 - POL Area (HAS-54)

Occasional tank truck overfills reportedly occurred at the Base POL area, sometimes resulting in the release of 200 to 300 gallons of JP-4. Although some portion of these fuel spills flow into storm sewers, much of the fuel is absorbed in soils bordering the POL area. Consequently, a HAS was applied because of the potential risk of groundwater contamination.

V. CONCLUSIONS

Information obtained through interviews with 28 Base personnel, review of Base records, and field observations have resulted in the identification of eight potentially contaminated disposal and/or spill sites on the Base. All of these sites exhibit the potential for contaminant migration to groundwater supplies; therefore, these sites were further evaluated using HARM. The identified sites consist of the following:

Site No. 1 - Old Fire Training Area (HAS-63)
Site No. 2 - Solvent Dumping Area - East Fenceline (HAS-66)
Site No. 3 - Storm Drain Discharge Point - Gatehouse (HAS-81)
Site No. 4 - Base Parking Lot - West (HAS-69)
Site No. 5 - Old Wash Rack Area (HAS-51)
Site No. 6 - Solvent Dumping Area (HAS-59)
Site No. 7 - Edges of Aircraft Parking Apron (HAS-65)
Site No. 8 - POL Area (HAS-54)

Groundwater beneath the Base is susceptible to contamination. The upper unconfined aquifer is composed of permeable sands, sandy clays, and clayey sands, overlain by soils of moderate to moderately slow permeability. The lower aquifer may be partially protected from contamination by 200 to 300 feet of overlying clays.

Almost all storm runoff from the Base is discharged into Airport Wash; most of this runoff then infiltrates into the soil and recharges groundwater supplies. Any surface pollutants discharged into Airport Wash or onto the ground can easily enter the groundwater with the infiltrating rainfall.

Hydrologic investigations of the Tucson International Airport area indicate that the upper unconfined aquifer is contaminated with TCE. Contamination has been found in wells tapping this aquifer, including the Base water supply well and wells supplying a nearby trailer park. Without further investigation, the source of this contamination cannot be determined, especially given the numerous hazardous waste generating industries located in and around the airport complex.

VI. RECOMMENDATIONS

Because of the potential for contaminant migration at the Base, initial investigative stages of the IRP SI/RI/FS are recommended for all of the scored sites. The following general recommendations are made to ascertain if groundwater has been contaminated by the eight identified sites, and to confirm or refute that Base-generated contaminants are migrating off the Base. Because previous investigations of the Tucson airport area have revealed extensive contamination of groundwater by TCE, additional IRP investigations may be needed to determine if contaminated groundwater is migrating beneath the Base from other sources.

Site No. 1 - Old Fire Training Area

Further IRP analysis is required at this site to determine if contamination exists.

Site No. 2 - Solvent Dumping Area - East Fenceline

Further IRP analysis is required at this site to determine if contamination exists.

Site No. 3 - Storm Drain Discharge Point - Gatehouse

Contamination at this site has been confirmed. Further IRP analysis should be performed to determine the extent of contamination and to determine if groundwater contamination exists.

Site No. 4 - Base Parking Lot - West

Further IRP analysis is required at this site to determine if contamination exists.

Site No. 5 - Old Wash Rack Area

Further IRP analysis is required at this site to determine if contamination exists.

Site No. 6 - Solvent Dumping Area

Further IRP analysis is required at this site to determine if contamination exists.

Site No. 7 - Edges of Aircraft Parking Apron

Further IRP analysis is required at this site to determine if contamination exists.

Site No. 8 - POL Area

Further IRP analysis is required at this site to determine if contamination exists.

GLOSSARY OF TERMS

AQUICLUDE - A confining bed that prevents the flow of water to or from an adjacent aquifer.

AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of groundwater to wells and springs.

AQUITARD - A confining bed that retards but does not prevent the flow of water to or from an adjacent aquifer.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act (SARA) shall include, but not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof, which is not otherwise specifically listed or designated as a hazardous substance under

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress),

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CRITICAL HABITAT - The native environment of an animal or plant which, due either to the uniqueness of the organism or the sensitivity of the environment, is susceptible to adverse reactions in response to environmental changes such as those induced by chemical contaminants.

ENDANGERED SPECIES - Wildlife species that are designated as endangered by the U.S. Fish and Wildlife Service.

GROUNDWATER - The subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the U.S. Air Force to develop and maintain a priority listing of potentially contaminated sites, on installations and facilities, for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December, 1981).

HAS - Hazard Assessment Score - The score developed by utilizing the Hazardous Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may

a. cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or

b. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HYDRAULIC CONDUCTIVITY - The rate at which water can move through a permeable medium.

HYDRAULIC GRADIENT - The difference in head (elevation of water surface) at two points divided by the distance between these two points.

MIGRATION (Contaminant) - The movement of contaminants through pathways (groundwater, surface water, soil, and air).

PD-680 - A cleaning solvent composed predominately of mineral spirits; Stoddard solvent.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as to the number of inches per hour that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow	- less than 0.06 inches per hour (less than 4.2×10^{-5} cm/sec)
Slow	- 0.06 to 0.20 inches per hour (4.23×10^{-5} to 1.4×10^{-4} cm/sec)
Moderately Slow	- 0.2 to 0.6 inches per hour (1.4×10^{-4} cm/sec)
Moderate	- 0.6 to 2.0 inches per hour ($4.2 \times 10^{-4} \times 10^{-3}$ cm/sec)
Moderately Rapid	- 2.0 to 6.0 inches per hour (1.4×10^{-3} to 4.2×10^{-3} cm/sec)

Rapid - 6.0 to 20 inches per hour (4.2×10^{-3} to 1.4×10^{-2} cm/sec)

Very Rapid - more than 20 inches per hour (more than 1.4×10^{-2} cm/sec)

(Reference: U.S.D.A. Soil Survey)

SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.

THREATENED SPECIES - Wildlife species that are designated as threatened by the U.S. Fish and Wildlife Service.

TOPOGRAPHY - The general conformation of a land surface, including its relief and the position of its natural and manmade features.

UNCONFINED AQUIFER - Upper limit of the aquifer as defined by the water table itself when the top of the saturated layer is at atmospheric pressure.

UPGRADIENT - A direction that is topographically or hydraulically upslope.

WATER TABLE - The upper limit of the portion of the ground that is wholly saturated with water.

WETLANDS - An area subject to permanent or prolonged inundation or saturation, and that exhibits plant communities adapted to this environment.

WILDERNESS AREA - An area unaffected by anthropogenic activities and deemed worthy of special attention to maintain its natural condition.

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2. 162nd TFG Master Plan, 1985. Arizona Air National Guard, Tucson International Airport, Tucson, Arizona.

3. Mock, P.A., and others, 1985. Results of the Tucson Airport Area Remedial Investigation. Phase I, Volume II, Contaminant Transport Modelling. Arizona Department of Water Resources.

4. Schmidt, K.D., 1985. Results of the Tucson Airport Remedial Investigation. Phase I, Volume I, Summary Report. Arizona Department of Water Resources.

5. Soil Conservation Service. Soil Survey of Pima County (Eastern Part). Advance Copy from Tucson Field Office, Tucson, Arizona.

Appendix A
Resumes of Search Team Members

JEFFREY J. SPANN

EDUCATION

B.S., chemistry, Lincoln University, 1979

CERTIFICATIONS

Environmentalist, Maryland Hazardous Materials Conference
Technician, Maryland CHS Vehicle Operations for Hazardous Materials

SECURITY CLEARANCE

Secret/DISCO

EXPERIENCE

Four years of technical and management experience in all aspects of hazardous waste/materials management. Developed National Institutes of Health (NIH) protocol for removal and disposal of hazardous waste for compliance with federal regulations such as the Resource Conservation and Recovery Act, Department of Transportation and the Environmental Protection Agency. Was a member of the NIH Emergency Response Team responsible for chemical spill cleanups, chemical decontamination procedures and personnel protection.

EMPLOYMENT

Dynamac Corporation, HMTC (1984-present): Environmental Scientist

Works on assignments in hazardous materials/hazardous waste management. Conducted an extensive evaluation, including site visits, of U.S. Army installations for USE Solvent Elimination Program for U.S. Army Materiel Command (AMC). Was contributing author of DOD instructional manual 4145.19, Storage and Handling of Hazardous Materials. Conducted an extensive evaluation, including site inspections, of government-owned/contractor-operated polychlorinated biphenyl storage facilities for U.S. Army Materials Development and Readiness Command. Provides expertise to the Hazardous Materials Technical Center on all aspects of hazardous materials/hazardous waste management including transportation, storage, handling, and disposal.

Advanced Environmental Technology Corporation (1981-1984): Chemist/Technical Supervisor

As technical supervisor for hazardous materials/waste management at the National Institutes of Health (NIH), managed the removal of hazardous materials/wastes from research, administrative, and maintenance facilities on NIH's main and satellite campuses. Consulted with the Environmental Protection Branch of NIH regarding laboratory safety. Responsible for the packaging of hazardous waste materials including explosives, as well as cylinder disposal. Responsible for all documentation such as the manifesting of hazardous waste material leaving NIH and traveling to appropriate TSDF and landfill facilities. Supervised the training of staff in hazardous waste management procedures and disciplines and the evaluation of collection and disposal procedures for improvements and/or revisions on NIH's main and satellite campuses.

HARDWARE/SOFTWARE

IBM PC XT and AT, Lotus 1-2-3

ERIC A. KUHL

EDUCATION

B.A., political science/environmental policy, St. Mary's College of Maryland, 1982

Right To Know/Hazard Communication Seminar, Executive Enterprises, Inc. April 10-11, 1985

Environmental Laws and Regulations Course, Government Institutes, Inc. May 16-17, 1985

Geographic Aspects of Pollution, University of Maryland, University College, Fall 1984

EXPERIENCE

Three years of experience with on-line information systems, including analysis and summarization of legal/technical documentation pertinent to large-scale computerized litigation support projects. Regulatory experience involving research, tracking and analysis of federal and state transportation/motor carrier safety, environmental and occupational safety regulations, for eventual input into on-line data base systems. Currently conducting site investigations and preliminary assessments for the Air Force's Installation Restoration Program (IRP) and the Federal Bureau of Prisons.

EMPLOYMENT

Dynamac Corporation (1984-present): Staff Scientist

Responsibilities include site investigations, preliminary assessments, and report writing for the Phase I portion of the IRP for the Air National Guard. Also performs similar work for the Department of Justice's Federal Bureau of Prisons. Activities for these tasks entail hazardous waste site identification and assessment, and development of advisory recommendations for further site investigation. Authored the Army Materiel Command's Solvent Recovery Regulatory Impact Report, and performed regulatory analysis for DLA's used drum recycling study.

Previously, participated in the construction of an environmental regulatory information system. This task required detailed familiarization with key environmental regulations including RCRA, CERCLA, and the Hazardous Materials Transportation Act. Was also responsible for tracking relevant legislation and regulations at the federal and state levels.

Automated Sciences Group (1983-1984): Regulatory Analyst

Performed regulatory analysis of the Occupational Safety and Health Administration's regulatory dockets for the OSHA Technical Information System. Also assisted in the compilation of technical guidelines for the OSHA Technical Information System.

Aspen Systems Corporation (1982-1983): Document Analyst

Analyzed and summarized technical documents on the various aspects of nuclear power plant construction for a large-scale litigation project. Was also responsible for screening large numbers of documents to determine their relevance to the case.

PUBLICATIONS

Controversies Emerge on OSHA's Hazard Communication Standard, co-author, HMTC Update 4(4), July 1985.

Used Oil Regulation Proposed, co-author, HMTC Technical Bulletin, HMTC Update 5(4), July 1986.

AMC Solvent Study, Evaluation of Regulatory Impact on Solvent Recovery, July 1986.

JANET SALYER EMRY

EDUCATION

M.S., geology, Old Dominion University, 1987
B.S. (cum laude), geology, James Madison University, 1983

EXPERIENCE

Three years' technical experience in the fields of hydrogeology and environmental science, including drilling and placement of wells, well monitoring, aquifer testing, determination of hydraulic properties, computer modeling of aquifer systems, and field and laboratory soils analysis.

EMPLOYMENT

Dynamac Corporation (1987-present): Staff Scientist/Hydrogeologist

Responsibilities include Preliminary Assessments, Site Investigations, Remedial Investigations, Feasibility Studies, and Emergency Responses to include providing geological and hydrological assessments of hazardous waste disposal/spill sites, determination of rates and extents of contaminant migration, and computer modeling of groundwater flow and contaminant transport. Projects are for the U.S. Air Force and Air National Guard Installation Restoration Program.

Froehling and Robertson, Inc. (1986-1987): Geologist/Engineering Technician

Performed both field and laboratory engineering soils tests.

The Nature Conservancy (1985-1986): Hydrogeologist

Investigated groundwater geology of the Nature Conservancy's Nags Head Woods Ecological Preserve in Dare County, North Carolina. Study included installing wells, monitoring water table levels, determination of hydraulic parameters through a pumping test, stratigraphic test borings, and computer modeling.

Old Dominion University (1983-1985): Teaching Assistant, Department of Geological Sciences

Taught laboratory classes in Earth Science and Historical Geology.

PROFESSIONAL AFFILIATIONS

Geological Society of America
National Water Well Association/Association of Ground Water Scientists and Engineers

PUBLICATION

Impact of Municipal Pumpage Upon a Barrier Island Water Table, Nags Head and Kill Devil Hills, North Carolina. In: Abstracts with Programs, Geological Society of America, Vol. 19, No. 2, February 1987.

MARK D. JOHNSON

EDUCATION

B.S., geology, James Madison University, 1980

EXPERIENCE

Seven years' technical experience including geologic mapping, subsurface investigations, foundation inspections, groundwater monitoring, pumping and observation well installation, geotechnical instrumentation, groundwater assessment, preparation of Air Force Installation Restoration Program Guidance and preparation of statements of work for the Air Force and the Air National Guard.

EMPLOYMENT

Dynamac Corporation (1984-present): Staff Scientist/Geologist

Primarily responsible for preparing statements of work for Phase IV-A of the Air Force's Installation Restoration Program, statements of work for Phase II and Phase IV-A of the Air National Guard's Installation Restoration Program, and assessing groundwater of hazardous waste disposal/spill sites on military installations for the purpose of determining rates and extents of contaminant migration and for developing site investigations, remedial investigations and identifying remedial actions. Prepared management guidance document for the Air Force's Installation Restoration Program.

Bechtel Associates Professional Corporation (1981-1984): Geologist

Performed the following duties in conjunction with major civil engineering projects including subways, nuclear power plants and buildings: prepared geologic maps of surface and subsurface facilities in rock and soil including tunnels, foundations and vaults; assessed groundwater conditions in connection with construction activities and groundwater control systems; monitored the installation of permanent and temporary dewatering systems and observation wells; monitored surface and subsurface settlement of tunnels; and participated in subsurface investigations.

Schnabel Engineering Associates (1981): Geologist

Inspected foundations and backfill placement.

PROFESSIONAL AFFILIATIONS

Association of Engineering Geologists
National Water Well Association/Association of Ground Water Scientists and Engineers
British Tunneling Society

RAYMOND G. CLARK, JR.

EDUCATION

Completed graduate engineering courses, George Washington University, 1957
B.S., mechanical engineering, University of Maryland, 1949

SPECIALIZED TRAINING

Grad. European Command Military Assistance School, Stuttgart, 1969
Grad. Army Psychological Warfare School, Fort Bragg, 1963
Grad. Sanz School of Languages, D.C., 1963
Grad. DOD Military Assistance Institute, Arlington, 1963
Grad. Defense Procurement Management Course, Fort Lee, 1960
Grad. Engineer Officer's Advanced Course, Fort Belvoir, 1958

CERTIFICATIONS

Registered Professional Engineer: Kentucky (#4341); Virginia (#8303); Florida (#36228)

EXPERIENCE

Twenty-nine years of experience in engineering design, planning and management including construction and construction management, environmental, operations and maintenance, repair and utilities, research and development, electrical, mechanical, master planning and city management. Over six years' logistical experience including planning and programming of military assistance materiel and training for foreign countries, serving as liaison with American private industry, and directing materiel storage activities in an overseas area. Over two years' experience as an engineering instructor. Extensive experience in personnel management, cost reduction programs, and systems improvement.

EMPLOYMENT

Dynamac Corporation (1986-present): Program Manager

Responsible for activities relating to Phases I, II and IV of the U.S. Air Force Installation Restoration Program including records search, review and evaluation of previous studies; preparation of statements of work, feasibility studies; preparation of remedial action plans, designs and specifications; review of said studies/plans to ensure that they are in conformance with requirements; review of environmental studies and reports; and preparation of Air Force Installation Restoration Program Management Guidance.

Howard Needles Tammen & Bergendoff (HNTB) (1981-1986): Manager

Responsible, as Project Manager, for: design of a new concourse complex at Miami International Airport to include terminal building, roadway system, aircraft apron, drainage channel relocation, satellite building with underground pedestrian tunnel, and associated underground utility corridors, to include subsurface aircraft fueling systems, with an estimated construction cost of $163 million; a cargo vehicle tunnel under the crosswind runway with an estimated construction cost of $15 million; design and construction of two large corporate jet aircraft hangars; and for the hydrocarbon recovery program to include investigation, analysis, design of recovery systems, monitoring of recovery systems, and planning and design of residual recovery systems utilizing biodegradation. Participated, as sub-consultant, in Air Force IRP seminar.

HNTB (1979-1981): Airport Engineer

Responsibilities included development of master plan for Iowa Air National Guard base; project initiation assistance for a new regional airport in Florida; engineering assistance for new facilities design and construction for Maryland Air National Guard; master plan for city maintenance facilities, Orlando, Florida; in-country master plan and preliminary engineering project management for Madrid, Spain, International Airport; and project management of master plan for Whiting Naval Air Station and outlying fields in Florida.

HNTB (1974-1979): Design Engineer

Responsibilities included development of feasibility and site selection studies for reliever airports in Cleveland and Atlanta; site selection and facilities requirements for the Office of Aeronautical Charting and Cartography, NOAA; and onsite mechanical and electrical engineering design for terminal improvements at Baltimore-Washington International Airport, Maryland.

HNTB (1972-1974): Airport Engineer

Responsible for development of portions of the master plan and preliminary engineering for a new international airport for Lisbon, Portugal, estimated to cost $250 million.

Self-employed (1971-1972): Private Consultant

Responsible for engineering planning and installation of a production line for multimillion-dollar contract in Madrid, Spain, to fabricate transmissions and differentials for U.S. Army vehicles.

U.S. Army, Corps of Engineers (1969-1971): Chief, Materiel & Programs

Directed materiel planning and military training programs of military assistance to the Spanish Army. Controlled arrival and acceptance of materiel by host government. Served as liaison/advisor to American industry interested in conducting business with Spanish government. Was Engineer Advisor to Spanish Army Construction, Armament and Combat Engineers, also the Engineer Academy and Engineer School of Application.

Corps of Engineers (1968-1969): Chief, R&D Branch, OCE

Directed office responsible to Chief of Engineers for research and development. Developed research studies in new concepts of bridging, new explosives, family of construction equipment, night vision equipment, expedient airfield surfacing, expedient aircraft fueling systems, water purification equipment and policies, prefabricated buildings, etc. Achieved Department of Army acceptance for development and testing of new floating bridge. Participated in high-level Department Committee charged with development of a Tactical Gap Crossing Capability Model.

Corps of Engineers (1967-1968): Division Engineer

Facilities engineer in Korea. Was fully responsible for management and maintenance of 96 compounds within 245 square miles including 6,000+ buildings, 1 million linear feet of electrical distribution lines, 18 water purification and distribution systems, sanitary sewage disposal systems, roads, bridges, and fire protection facilities with real property value of more than $256 million. Planned and developed the first five-year master plan for this area. Administered $12 million budget and $2 million engineer supply operation. Was in responsible charge of over 500 persons. Developed and obtained approval for additional projects worth $9 million for essential maintenance and repair. Directed cost reduction programs that produced more than $500,000 savings to the United States in the first year.

Corps of Engineers (1963-1967): Engineer Advisor

Engineer and aviation advisor to the Spanish Army. Developed major modernization program for Spanish Army Engineers, including programming of modern engineer and mobile maintenance equipment. Directed U.S. portion of construction, testing and acceptance of six powder plants, one shell loading facility, an Engineer School of Application, and depot rebuild facilities for engineer, artillery, and armor equipment. Planned and developed organization of a helicopter battalion for the Spanish Army. Responsible for sales, delivery, assembly and testing of 12 new helicopters in country. Provided U.S. assistance to unit until self-sufficiency was achieved. Was U.S. advisor to Engineer Academy, School of Application and Polytechnic Institute.

Corps of Engineers (1960-1963): Deputy District Engineer

Responsible for planning and development of extensive construction projects in the Ohio River Basin for flood control and canalization, including dam, lock, bridge, and building construction, highway relocation, watershed studies, real estate acquisitions and dispositions. Was contracting officer for more than $75 million of projects per year. Supervised approximately 1,300 personnel, including 300 engineers. Planned and directed cost reduction programs amounting to more than $200,000 per year. Programmed and controlled development of a modern radio and control net in a four-state area.

Corps of Engineers (1959-1960): Area Engineer

Directed construction of a large airfield in Ohio as Contracting Officer's representative. Assured that all construction (runway, steam power plant, fuel transfer and loading facilities, utilities, buildings, etc.) complied with terms of plans and specifications. Was onsite liaison between Air Force and contractors.

Corps of Engineers (1958-1959): Chief, Supply Branch

Managed engineer supply yard containing over $21 million construction supplies and engineer equipment. Directed in-storage maintenance, processing and deprocessing of equipment. Achieved complete survey of items on hand, a new locator system and complete rewarehousing, resulting in approximately $159,000 savings in the first year.

Corps of Engineers (1957-1958): Student

U.S. Army Engineer School, Engineer Officer's Advanced Course.

Corps of Engineers (1954-1957): Engineer Manager

Managed engineer construction projects and was assigned to staff and faculty of the Engineer School. Was in charge of instruction on engineer equipment utilization, management and maintenance. Directed Electronic Section of the school. Coordinated preparation of five-year master plan for the Department of Mechanical and Technical Equipment.

Corps of Engineers (1949-1954): Engineer Commander

Positions of minor but increasing importance and responsibility in engineering management, communications, demolitions, construction administration and logistics.

PROFESSIONAL AFFILIATIONS

Member, National Society of Professional Engineers
Fellow, Society of American Military Engineers
Member, American Society of Civil Engineers
Member, Virginia Engineering Society
Member, Project Management Institute

HARDWARE

IBM PC

SOFTWARE

Lotus 1-2-3, D Base III Plus, Framework, Project Scheduler 5000, Harvard Project Manager, Volkswriter, Microsoft Project

Appendix B
Interviewee Information

List of Interview Identification Numbers

Interviewee Number	Primary Duty Assignment	Years Associated With Arizona ANG
1	Weapon Release Supervisor	26
2	Metal Mechanic Foreman	28
3	Electrician	26
4	Hydraulic Shop	28
5	Weapons Loading	24
6	Flight Chief	30
7	Motor Pool	30
8	Graphic Artist	30
9	Aircraft Maintenance	30
10	Aircraft Maintenance	31
11	Aircraft Radio Maintenance	24
12	Hydraulic Shop	26
13	Field Maintenance	30
14	Flight Control/Aircraft Maintenance	24
15	Life Support	24
16	Engine Shop	29
17	Communications	20
18	Avionics/Munitions	20
19	Hanger/Flightline	29
20	Munitions	16
21	Support Aircraft Maintenance	26
22	AGE/Flightline	30
23	Jet Engine Shop	30
24	Fire Chief	29
25	Munitions	30
26	Electric Shop	18
27	Fuel Systems Shop	17
28	Flightline Technician	29

Appendix C
Outside Agency Contact List

OUTSIDE AGENCY CONTACT LIST

1. Arizona Department of Environmental Quality
   2005 N. Central Avenue
   Phoenix, AZ 85004

2. Arizona Department of Water Resources
   99 E. Virginia
   Phoenix, AZ 85004

3. Arizona Game and Fish Department
   Region V
   555 North Greaswood
   Tucson, Arizona 85701-1276

4. National Oceanic and Atmospheric Administration
   6001 Executive Boulevard
   Rockville, Maryland 20853

5. Soil Conservation Service
   Tucson Field Office
   3241 North Romero Road
   Tucson, Arizona 85705

6. U.S. Environmental Protection Agency
   215 Fremont Street
   San Francisco, CA 94105

7. United States Geological Survey
   12201 Sunrise Valley Drive
   Reston, Virginia 22092

Appendix D
USAF Hazard Assessment Rating Methodology

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The Department of Defense (DoD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DoD facilities. One of the actions required under this program is to:

> develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air National Guard in setting priorities for follow-on site investigations.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD program needs.

The model uses data readily obtained during the Records Search portion (Phase I) of the IRP. Scoring judgment and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1 of this report). The site rating form and the rating factor guideline are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: possible receptors of the contamination, the waste and its characteristics, the potential pathways for contamination migration, and any efforts that were made to contain the wastes resulting from a spill.

The receptors category rating is based on four rating factors: the potential for human exposure to the site, the potential for human ingestion of contaminants should underlying aquifers be polluted, the current and anticipated uses of the surrounding area, and the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1,000 feet of the site, and the distance between the site and the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 x factor score subtotal/ maximum score subtotal).

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways: surface-water migration, flooding, and groundwater migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned, and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no containment are not reduced. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factory to the sum of the scores for the other three categories.

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ____________________

LOCATION ____________________

DATE OF OPERATION OR OCCURRENCE ____________________

OWNER/OPERATOR ____________________

COMMENTS/DESCRIPTION ____________________

SITE RATED BY ____________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to installation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	____	____

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ____

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ____
2. Confidence level (C - confirmed, S - suspected) ____
3. Hazard rating (H - high, M - medium, L - low) ____

Factor Subscore A (from 20 to 100 based on factor score matrix) ____

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

____ X ____ = ____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

____ X ____ = ____

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		

Subtotals ______ ______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 X factor score/3) ______

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		

Subtotals ______ ______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ☐

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels: 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-15	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	H
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	H
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level
- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating
- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($>10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall	<1.0 inch	1.0 to 2.0 inches	2.1 to 3.0 inches	>3.0 inches	8
(Thunderstorms)	0-5 0	6-35 30	36-49 60	>50 100	

B-2 Potential for Flooding

Rating Factors	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Ground-Water Contamination

Rating Factors	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to + 20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8

B-3 Potential for Ground-Water Contamination--Continued

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

GNR122

Appendix E
Site Hazardous Assessment Rating Forms

162nd Tactical Fighter Group
Arizona Air National Guard
Tucson International Airport
Tucson, Arizona

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

1. RECEPTORS

Population within 1,000 feet of site:	Over 100
Distance to nearest well:	Less than 3,000 feet
Land use/zoning within 1 mile radius:	Industrial/Residential
Distance to installation boundary:	
Site No. 1	Less than 400 feet
Site No. 2	Immediately adjacent
Site No. 3	Less than 50 feet
Site No. 4	Immediately adjacent
Site No. 5	Less than 1,200 feet
Site No. 6	Less than 600 feet
Site No. 7	Less than 100 feet
Site No. 8	Less than 800 feet
Critical environments within 1 mile:	None
Water quality of nearest surface water body:	None
Groundwater use of uppermost aquifer:	Drinking (municipal water supply)
Population served by surface water supply within 3 miles downstream of site:	None
Population served by groundwater supply within 3 miles of site:	More than 1,000

2. WASTE CHARACTERISTICS

Quantity

Site No. 1	Less than 3,000 gallons
Site No. 2	Less than 1,500 gallons
Site No. 3	More than 5,000 gallons
Site No. 4	More than 10,000 gallons

162nd Tactical Fighter Group
Arizona Air National Guard
Tucson International Airport
Tucson, Arizona

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

2. WASTE CHARACTERISTICS (Continued)

Quantity (Continued)

Site No. 5	Less than 1,000 gallons
Site No. 6	Less than 1,000 gallons
Site No. 7	Less than 4,000 gallons
Site No. 8	Less than 1,000 gallons.

Confidence Level

Site No. 1	Confirmed
Site No. 2	Confirmed
Site No. 3	Confirmed
Site No. 4	Confirmed
Site No. 5	Suspected
Site No. 6	Confirmed
Site No. 7	Confirmed
Site No. 8	Suspected

Hazard Rating

Site No. 1	High
Site No. 2	High
Site No. 3	High
Site No. 4	High
Site No. 5	High
Site No. 6	High
Site No. 7	High
Site No. 8	High

3. PATHWAYS

Surface Water Migration

Distance to nearest surface water:	Usually dry, but immediately adjacent to Base

162nd Tactical Fighter Group
Arizona Air National Guard
Tucson International Airport
Tucson, Arizona

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

3. PATHWAYS (Continued)

Surface Water Migration (Continued)

Net precipitation:	-55 inches
Surface erosion	Moderate to severe
Surface permeability:	1.4×10^{-4} to 4.2×10^{-4}
Rainfall intensity:	1.6 inches

Flooding: Beyond 100-year floodplain

Groundwater Migration

Depth to groundwater:	50 feet
Net precipitation:	-55 inches
Soil permeability:	1.4×10^{-4} to 4.2×10^{-4}
Subsurface flow:	More than 5 feet above high groundwater level
Direct access to groundwater:	High risk

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Old FTA - Site I

LOCATION east of runway apron

DATE OF OPERATION OR OCCURRENCE Late 1950's to 1965

OWNER/OPERATOR Arizona ANG

COMMENTS/DESCRIPTION

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	111	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.9 = 72

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

72 x 1.0 = 72

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	1	8	8	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	3	8	24	24
		Subtotals	40	114

Subscore (100 X factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	62
Waste Characteristics	72
Pathways	56

Total 190 divided by 3 = 63 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

63 x 1 = $\boxed{63}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Solvent Dumping Area - Site 2

LOCATION along west fenceline

DATE OF OPERATION OR OCCURRENCE late 1950's to 1972

OWNER/OPERATOR Arizona ANG

COMMENTS/DESCRIPTION

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	111	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	1	8	8	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	3

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	3	8	24	24
		Subtotals	40	114

Subscore (100 X factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	62
Waste Characteristics	80
Pathways	56

Total 198 divided by 3 = 66 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

66 x 1.0 = $\boxed{66}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Storm drain discharge point - Site 3

LOCATION Airport wash, near Gatehouse

DATE OF OPERATION OR OCCURRENCE to present

OWNER/OPERATOR Arizona ANG

COMMENTS/DESCRIPTION

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	8
I. Population served by ground-water supply within 3 miles of site		6		
Subtotals			111	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 1.0 = 100

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

100 x 1.0 = 100

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	1	8	8	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	2	1	2	3

Subscore (100 X factor score/3) 67

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	3	8	24	24
		Subtotals	40	114

Subscore (100 X factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	62
Waste Characteristics	100
Pathways	80
Total 242 divided by 3 =	81
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

81 x 1.0 = $\boxed{81}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Base parking lot - Site 4

LOCATION near western perimeter

DATE OF OPERATION OR OCCURRENCE late 1950's to 1980

OWNER/OPERATOR Arizona ANG

COMMENTS/DESCRIPTION

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	111	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 0.9 = 90

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

90 x 1.0 = 90

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	1	8	8	24
Subtotals			60	1[illegible]8

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	0

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	3	8	24	24
Subtotals			40	114

Subscore (100 X factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	62
Waste Characteristics	90
Pathways	56

Total 208 divided by 3 = 69 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

69 x 1.0 = $\boxed{69}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Old Wash Rack - Site 5

LOCATION near Pol truck maintenance

DATE OF OPERATION OR OCCURRENCE 1959-1985

OWNER/OPERATOR Arizona ANG

COMMENTS/DESCRIPTION

SITE RATED BY HMTC

1. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			105	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C - confirmed, S - suspected) S
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	1	8	8	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	0

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	3	8	24	24
		Subtotals	40	114

Subscore (100 X factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	58
Waste Characteristics	4[illegible]
Pathways	56

Total 154 divided by 3 = 51
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

51 x 1.[illegible] = 51

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Solvent dumping area - Site 6

LOCATION along fence between buildings 41 and 44

DATE OF OPERATION OR OCCURRENCE up to 1977

OWNER/OPERATOR Arizona ANG

COMMENTS/DESCRIPTION

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	111	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	1	8	8	24
Subtotals			60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	0

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	3	8	24	24
Subtotals			40	114

Subscore (100 X factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 62
Waste Characteristics 60
Pathways 56

Total 178 divided by 3 = 59 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

59 x 1.0 = $\boxed{59}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Edges of Aircraft Parking Apron - Site 7

LOCATION

DATE OF OPERATION OR OCCURRENCE

OWNER/OPERATOR Arizona ANG

COMMENTS/DESCRIPTION

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	2	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			105	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 3[illegible]

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	1	8	8	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 X factor score/3) ______

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	3	8	24	24
		Subtotals	40	114

Subscore (100 X factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	58
Waste Characteristics	30
Pathways	56

Total 194 divided by 3 = 65 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

65 x 1.0 = $\boxed{65}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE POL Area - Site 8

LOCATION Northeast corner at base

DATE OF OPERATION OR OCCURRENCE to present

OWNER/OPERATOR Arizona ANG

COMMENTS/DESCRIPTION

SITE RATED BY HMTC

1. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	111	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 62

11. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C - confirmed, S - suspected) S
3. Hazard rating (H - high, M - medium, L - low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 90 = 45

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

45 x 1.0 = 45

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	2	8	16	24
Surface permeability	2	6	12	18
Rainfall intensity	1	8	8	24
Subtotals			60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 X factor score/3) 0

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	1	8	8	24
Net precipitation	0	6	0	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	3	8	24	24
Subtotals			40	114

Subscore (100 X factor score subtotal/maximum score subtotal) 35

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 56

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	62
Waste Characteristics	45
Pathways	56
Total 163 divided by 3 =	54
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

54 X 1.0 = 54

END
DATE
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